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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/801,208	03/16/2004	Kwang-hee Lee	5649-1277	2034
20792	7590	10/09/2007		
MYERS BIGEL SIBLEY & SAJOVEC			EXAMINER	
PO BOX 37428			TRAN, THANH Y	
RALEIGH, NC 27627			ART UNIT	PAPER NUMBER
			2822	
			MAIL DATE	DELIVERY MODE
			10/09/2007	PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

**Office Action Summary**

Application No.

10/801,208

Applicant(s)

LEE ET AL.

Examiner

Thanh Y. Tran

Art Unit

2822

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 12 July 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 2-14 and 34-47 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 4-8, 14, 34-45 and 47 is/are allowed.
- 6) ☒ Claim(s) 2-3, 9-13 and 46 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_.

**DETAILED ACTION**

***Claim Rejections - 35 USC § 103***

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 2-3, 9-13, and 46 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kiyotoshi et al (U.S. 2003/0017669) in view of Hong (U.S. 6,756,261) and Pakr (U.S. 6,656,784).

As to claim 13, Kiyotoshi et al discloses in figures 9A-9D a method of fabricating an electrode for a microelectronic device, the method comprising: forming a ruthenium seed layer (912) (see paragraph [0016]) on a semiconductor substrate; forming a main ruthenium layer (913) (see paragraph [0019]) on the ruthenium seed layer (912); and patterning the main ruthenium layer (913) and the ruthenium seed layer (912) to form the electrode (see figures 9B-9C).

Kiyotoshi et al does not disclose the ruthenium seed layer is formed by using atomic layer deposition.

Hong discloses in col. 3, lines 28-33 a method wherein the Ru layer is formed by using atomic layer deposition. Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to modify the method of Kiyotoshi et al by using atomic layer deposition method for forming a Ru layer as taught by Hong for controlling the composition easily with excellent step coverage (col. 3, lines 28-33 in Hong).

Kiyotoshi et al in view of Hong does not disclose the main ruthenium layer is formed using chemical vapor deposition.

Pakr discloses in figure 3C a method wherein the main ruthenium layer (42) is formed using chemical vapor deposition (see col. 5, lines 15-20). Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to modify the method of Kiyotoshi et al in view of Hong by use chemical vapor deposition for forming the main ruthenium layer as taught by Pakr for producing high-quality depositing layer.

As to claim 2, Kiyotoshi et al discloses in figures 9A-9D a method further comprising: forming a dielectric layer (107) on the electrode; and forming an upper electrode (figure 9B) on the dielectric layer to provide a capacitor (see paragraphs [0014], [0018]).

As to claim 3, Kiyotoshi et al discloses in figures 9A-9D a method further comprising: forming a storage node contact plug (108) on the semiconductor substrate and a storage node that is electrically connected to the storage node contact plug (108) to provide a semiconductor memory device, wherein the ruthenium seed layer (912) is formed on the storage node contact plug (108).

As to claim 9, Kiyotoshi et al does not disclose the ruthenium seed layer having a thickness of about 5 Å to 50 Å, and the main ruthenium layer having a thickness of 50 Å to 300 Å. However, the thickness range for a layer would have been obvious to an ordinary artisan practicing the invention because, absent evidence of disclosure of criticality for the range giving unexpected results, it is not inventive to discover optimal or workable ranges by routine experimentation. In re Aller, 220 F.2d 454, 105 USPQ 233, 235 (CCPA 1955). Furthermore, the specification contains no disclosure of either the critical nature of the claimed dimensions of

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any unexpected results arising therefrom. Where patentability is aid to be based upon particular chosen dimensions or upon another variable recited in a claim, the Applicant must show that the chosen dimensions are critical. See *In re Woodruff*, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

As to claim 10, Kiyotoshi et al in view of Hong does not disclose supplying oxygen at a flow rate of about 1 sccm to 50 sccm for forming of the main ruthenium layer; and supplying a ruthenium source at a flow rate of about 0.1 ccm to 2 ccm under a pressure of about 0.4 Torr to 0.6 Torr. However, a flow rate of supplying oxygen of about 1 sccm to 50 sccm, or a flow rate of a ruthenium source about 0.1 ccm to 2 ccm under a pressure of about 0.4 Torr to 0.6 Torr would have been obvious to an ordinary artisan practicing the invention because, absent evidence of disclosure of criticality for the range giving unexpected results, it is not inventive to discover optimal or workable ranges by routine experimentation. *In re Aller*, 220 F.2d 454, 105 USPQ 233, 235 (CCPA 1955). Furthermore, the specification contains no disclosure of either the critical nature of the claimed dimensions of any unexpected results arising therefrom. Where patentability is aid to be based upon particular chosen dimensions or upon another variable recited in a claim, the Applicant must show that the chosen dimensions are critical. See *In re Woodruff*, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

As to claim 11, Kiyotoshi et al in view of Hong does not disclose the dielectric layer comprises a tantalum oxide layer. However, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the method of Kiyotoshi et al by using a tantalum oxide material for a dielectric layer for providing a suitable high-k material for the dielectric layer, since it has been held to be within the general skill of a worker in the art to

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select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. In re Leshin, 125 USPQ 416.

As to claim 12, figure 9C of Kiyotoshi et al discloses a method comprising: forming a second Ru seed layer (912) on the dielectric layer (107); and forming a second main Ru layer (913) on the second Ru seed layer (912).

Kiyotoshi et al does not disclose the ruthenium seed layer is formed by using atomic layer deposition.

Hong discloses in col. 3, lines 28-33 a method wherein the Ru layer is formed by using atomic layer deposition. Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to modify the method of Kiyotoshi et al by using atomic layer deposition method for forming a Ru layer as taught by Hong for controlling the composition easily with excellent step coverage (col. 3, lines 28-33 in Hong).

As to claim 46, Kiyotoshi et al in view of Hong and Pakr does not teach the hydrogen containing gas does not include oxygen. However, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the method of Kiyotoshi et al in view of Hong and Pakr by using hydrogen containing gas does not include oxygen for forming an electrode for a microelectronic device. Since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. In re Leshin, 125 USPQ 416.

***Allowable Subject Matter***

3. Claims 4-8, 14, 34-45 and 47 are allowed.
4. The following is an examiner's statement of reasons for allowance:

The prior art of record and to the examiner's knowledge does not teach or render obvious, at least to the skilled artisan, the instant invention regarding a method of fabricating an electrode for a microelectronic device, particularly characterized by forming a main Ru layer on the Ru seed layer formed by using atomic layer deposition; patterning the main Ru layer and the Ru seed layer to form the electrode; and injecting oxygen containing gas and hydrogen-containing gas into the chamber for forming the Ru seed layer using atomic layer deposition, as defined in claims 4 and 35. Claims 5-8, 14, 34-45 and 47 are dependent upon independent claims 4 and 35.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

#### *Response to Arguments*

5. Applicant's arguments with respect to claims 2-3, 9-13, and 46 have been considered but are moot in view of the new ground(s) of rejection.

#### *Conclusion*

6. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period

will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

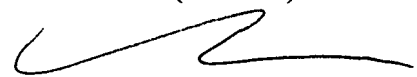
**Contact Information**

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thanh Y. Tran whose telephone number is (571) 272-2110. The examiner can normally be reached on M-F (9-6:30pm).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Zandra Smith can be reached on (571) 272-2429. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

TYT



M. Wilczewski  
Primary Examiner  
TC 2800